



## Mental Health

# The Relationship between Social Support and Postnatal Anxiety and Depression: Results from the Listening to Mothers in California Survey



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## ABSTRACT

**Background:** Perinatal mood and anxiety disorders (PMADs) impact multiple domains of maternal and child well-being. Estimates of postpartum depressive symptoms range from 6.5% to 12.9% and from 8.6% to 9.9% for postpartum anxiety. We sought to identify the role social support could play in mitigating PMADs.

**Methods:** The data are drawn from the Listening to Mothers in California survey; results are representative of women who gave birth in 2016 in a California hospital. The Patient Health Questionnaire-4 was used to assess total symptoms of PMADs and anxiety and depressive symptoms individually. Two questions adapted from the Medical Outcomes Study Social Support Survey were used to assess emotional, practical, and functional (combined) social support. After exclusions for missing data related to PMADs or social support, we analyzed data from 2,372 women.

**Results:** At the time of survey administration (mean 5.7 months after birth), 7.0% of respondents reported elevated PMAD symptoms and 45.9% reported that they always received functional social support. In multivariable analysis, controlling for demographic and pregnancy-related factors and prenatal anxiety and depressive symptoms, women who reported consistent support had a prevalence of elevated PMAD symptoms one-half that of those who did not (adjusted odds ratio, 0.50; 95% confidence interval, 0.34–0.74).

**Conclusions:** This study suggests that consistent social support serves as a robust protective factor against postpartum symptoms of PMADs. Because many predictors of PMADs are not modifiable, social support stands out as an important target for programmatic intervention, particularly in light of increased isolation related to the COVID-19 pandemic.

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Perinatal mood and anxiety disorders (PMADs) are defined as any mood or anxiety disorder identified during pregnancy and up to 1 year postpartum. The classification of PMADs is broad.

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Authors Feinberg, Declercq, and Belanoff had full access to the deidentified dataset used in the study and take responsibility for the integrity of the data and accuracy of the data analysis.

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During the postpartum period, it encompasses the formal diagnosis of postpartum depression, as well as anxiety and depressive symptoms occurring at any time during the first postpartum year (World Health Organization definition) (Fisher et al., 2012; McKee et al., 2020; Meltzer-Brody & Rubinow, 2021). Estimates for postpartum anxiety and postpartum depressive symptoms vary considerably depending on the sample and assessment measure, ranging from 7% to 20% of women (Dennis, Falah-Hassani et al., 2017a; Furtado, Chow, Owais, Frey, & Van Lieshout, 2018; Goodman, Chenausky, & Freeman, 2014; O'Hara & Wisner, 2014; Reck, Tietz, Muller, Seibold, & Tronick, 2018). For postpartum depressive symptoms, estimates of overall period prevalence in developed countries are closer to 6.5%–12.9% (Stewart & Vigod, 2016) and range from 8.6% to 9.9% for any

type of anxiety disorder (Dennis, Falah-Hassani, et al., 2017a; Goodman et al., 2016). There is considerable overlap between anxiety and depressive symptoms among women with PMADs. Most notably, women with postpartum depressive symptoms often have co-occurring anxiety (Austin et al., 2010). Anxiety in the absence of depressive symptoms is more common than depressive symptoms in the absence of anxiety, supporting the need to examine anxiety and depressive symptoms as distinct domains of PMADs (Falah-Hassani, Shiri, & Dennis, 2017; Kroenke, Spitzer, Williams, & Löwe, 2009; Prenoveau et al., 2013). PMADs impact multiple domains of maternal and child well-being, including preterm birth (Grigoriadis et al., 2018; Grigoriadis et al., 2013), difficulties in maternal–infant interaction, challenges in breastfeeding, and cognitive and behavioral development problems of the infant (Binda, Figueroa-Leigh, & Olhaverby, 2019; Field, 2018; Grote et al., 2010; Netsi et al., 2018; Reck et al., 2018; Slomian, Honvo, Emonts, Reginster, & Bruyère, 2019). These impacts were seen among offspring of mothers with both anxiety and depressive symptoms and, in many studies, extended into childhood and adolescence (Rogers et al., 2020). As a result, altering modifiable risk and preventive factors has the potential to improve the well-being of both women and infants.

There is a well-established literature documenting demographic and socio-behavioral characteristics associated with PMADs in general and postpartum depressive symptoms and postpartum anxiety specifically. Among demographic factors, poverty, Black race, Latinx ethnicity, recent migration, and adolescent pregnancy have been found to be associated with greater postpartum depressive symptoms (Dennis, Merry, & Gagnon, 2017b; Falah-Hassani, Shiri, Vigod, & Dennis, 2015; Hymas & Girard, 2019). However, it is likely that racism and residence in structurally marginalized communities—rather than an individual's race or ethnicity—are the mechanisms underlying many of these associations (Bailey et al., 2017). The literature identifying risk factors for postpartum anxiety disorders is less robust. However, reported risk factors for anxiety are similar to those for depressive symptoms: younger maternal age, prior pregnancy loss, and lower educational attainment (Biaggi et al., 2016; Field, 2018; Goodman et al., 2014; Martini et al., 2015). Prior history of depressive symptoms and anxiety is consistently reported as the strongest predictor of PMADs (Giannandrea, Cerulli, Anson, & Chaudron, 2013; Goodman & Tyer-Viola, 2010; Grant, McMahon, Reilly, & Austin, 2010; Martini et al., 2015).

Among potentially modifiable factors, multiple studies demonstrate an association between social support and PMADs. Social support, defined as resources received from others, can include support from partners, family, friends, and others within mothers' social networks. It is operationalized within different domains depending on the assessment measure and a study's research question. Domains can include emotional, instrumental, informational, tangible, interaction, or affectionate support (Eastwood, Jalaludin, Kemp, Phung, & Barnett, 2012; Hetherington, McDonald, Williamson, Patten, & Tough, 2018). Despite variations in the definitions of social support, existing research supports a consistent and strong relationship between social support, regardless of the domain, and the incidence and severity of PMADs. Mothers with lower social support are more likely to develop postpartum depressive symptoms (Dennis, Merry, et al., 2017b; Falah-Hassani et al., 2015; Kim, Connolly, & Tamim, 2014). Conversely, high social support serves as a protective factor, decreasing risk of depressive and anxiety symptoms (Dennis, Merry, et al., 2017b; Eastwood et al., 2012;

Reid & Taylor, 2015; Schwab-Reese, Schafer, & Ashida, 2017). Social support after birth is more strongly linked to lower risk of postpartum depressive symptoms than social support during pregnancy, which has shown variable correlations with postpartum symptoms (Asselmann, Kunas, Wittchen, & Martini, 2020; Biaggi, Conroy, Pawlby, & Pariente, 2016; Kim et al., 2014). For anxiety, evidence suggests that both prenatal and postnatal social support are associated with decreased anxiety (Martini et al., 2015). However, few studies have assessed depressive symptoms, anxiety, and social support in population-based samples and examined whether social support overall, and its specific domains, function differently among women who have anxiety or depressive symptoms. Further understanding of the benefits social support confers to women during the postpartum period would provide a stronger evidence base for more targeted intervention and improve the likelihood of positive impacts.

This study examined the relationship between social support and PMADs. Using data from a representative sample of new mothers from California, we aimed to determine whether the relationship between social support and postpartum symptoms of PMADs differed based on the type of social support and reported anxiety, depressive symptoms, and total burden of symptoms. We hypothesized that consistent social support would be associated with decreased likelihood of postpartum anxiety and depressive symptoms. We also assessed whether prenatal symptoms of PMADs, the most potent and consistent predictor of postnatal symptoms, affected these associations.

## Methods

### *Data Source and Participants*

The National Partnership for Women & Families, Boston University School of Public Health, and the University of California, San Francisco Center for Health Equity collaborated on the development of the Listening to Mothers in California (LtMC) survey. Quantum Market Research administered the survey. The drawing of the sample was similar to the process used by Pregnancy Risk Assessment and Monitoring Survey surveys (Shulman, D'Angelo, Harrison, Smith, & Lee, 2018), with the sampling frame based on California birth certificate files for births between September 1 and December 15, 2016. The following groups were excluded: nonresidents of California who happened to give birth there, women with out-of-hospital births, women with nonsingleton births, women less than 18 years of age, women who could not participate in English or Spanish, and women who were not living with their baby at the time of survey participation. Exclusion criteria were similar to previous versions of the national LtM surveys (National Partnership for Women and Families, n.d.). The recruitment of participants involved multiple invitations and reminder mailings, which included elements of informed consent and instructions on accessing the survey online via laptop, tablet, or phone using a unique code. The instructions also indicated how to reach a telephone interviewer and learn more about the project. The survey could be completed in English (81% of respondents) or Spanish (19%). Black women, women with midwifery-attended births, and those with a vaginal birth after cesarian section were oversampled to have sufficient sample sizes to analyze the experiences of women within these smaller groups.

The survey took, on average, slightly more than 30 minutes to complete. Sampled women could participate online using a

smartphone or any other device, or with an interviewer via telephone; 34% of respondents completed the survey online, 28% by phone with an interviewer, and 39% via both methods, typically starting online and finishing with an interviewer. The survey was conducted from February 22 through August 15, 2017. Women's responses therefore were obtained between 2 and 11 months (mean, 5.7 months) after giving birth. A detailed explanation of the methodology is presented in the LtMC report appendices (Sakala, Declercq, Turon, & Corry, 2018). The LtMC report, survey questionnaire, and related materials are available at both [www.nationalpartnership.org/LTMCA](http://www.nationalpartnership.org/LTMCA) and [www.chcf.org/collection/listening-to-mothers-in-california/](http://www.chcf.org/collection/listening-to-mothers-in-california/); the core dataset is available from the Odum Institute at the University of North Carolina (DOI: 10.15139/S3/3KW1DB).

The final sample size of 2,539 represented a response rate of 55%. The sample was weighted to be representative of the full 2016 year of California births to women aged 18 and older giving birth to single babies in California hospitals. The weighting was based on demographic and other variables from the 2016 Birth Statistical Master File. The Committee for the Protection of Human Subjects of California's Office of Statewide Health Planning and Development is the Institutional Review Board of record and approved the study and subsequent protocol amendments. The University of California, San Francisco Institutional Review Board also approved the project. The California Department of Public Health Vital Statistics Advisory Committee approved access to birth certificate data. The data were fully anonymized before the authors received the analytic file. The analysis was completed using SAS (Cary, NC) version 9.4.

### Measures of PMADs

#### Outcome variables

The survey included a series of mental health questions, based on the four-item Patient Health Questionnaire (PHQ-4) for anxiety and depressive symptoms (see [Supplementary Table 1](#) for question wording). The PHQ-4 is an ultra-brief screening tool that combines previously validated two-item screening questions for depressive symptoms and anxiety into one measure (Chronbach's alpha 0.85) (Kroenke et al., 2009). The PHQ-4 was validated in a large sample ( $N = 2,149$ ) of primary care patients drawn from 15 primary care clinics in the United States. Both construct and factorial validity were assessed. Construct validity demonstrated a strong relationship between increasing PHQ-4 scores and worsening functional status measured by the 20-Item Short Form Survey, increased disability days, and greater health service use. Factorial validity confirmed the existence of two distinct factors, anxiety and depressive symptoms, and substantiated anxiety's independent effect on functioning (Kroenke et al., 2009). The PHQ-4 questions ask about respondents' feelings in the 2 weeks before the survey administration (e.g., Over the past 2 weeks how often were you bothered by feeling down, depressed, or hopeless?). Response options are never (0), sometimes (1), usually (2), and always (3). Based on the scoring algorithm, women with a total score greater than or equal to 6 on the PHQ-4 are considered to have moderate or severe symptoms, which we refer to as elevated total symptom burden. Women with a total score greater than or equal to 3 on the two questions related to anxiety are considered to have anxiety; women with a total score greater than or equal to 3 on the two questions related to depression are considered to have depressive symptoms (Kroenke et al., 2009). We examined PMAD symptoms during the postpartum period using the

recommended scoring of the measure: total symptom burden, anxiety alone, and depressive symptoms alone.

### Control Variable

Symptoms of PMADs were assessed during the prenatal period using similar questions as were used postpartum, but a different referent time period was used. Women were asked retrospectively to answer how often they experienced these symptoms during their recent pregnancy. Prenatal symptoms were dichotomized as elevated total symptom burden, for example, moderate or severe symptoms (total score on PHQ-4 of  $\geq 6$ ) versus all other symptoms.

### Measure of Social Support

Social support was assessed using two questions adapted from the RAND Corporation's Medical Outcomes Study Social Support Survey, a brief multidimensional self-report survey (Sherbourne & Stewart, 1991). The Medical Outcomes Study Social Support Survey evaluates social support within the domains of emotional, informational, tangible, and affectionate support, and positive social interaction. The 19-item measure was validated in 2,987 participants who participated in the Medical Outcomes Study (Chronbach's alpha of 0.97). For this version of the Listening to Mothers survey, survey designers focused on the domains of emotional and tangible (referred to as practical) support, which were considered most salient to women's birth experience. Respondents were asked two questions about their perception of the level of social support they received postpartum: 1) "Since the birth of your baby, how often do you have someone you can turn to for *emotional support*, such as listening to your concerns and giving good advice?" and 2) "Since the birth of your baby, how often do you have someone you can turn to for *practical support*, such as helping you get things done or get information you need?" Women could respond never, sometimes, usually, or always. Emotional and practical social support were dichotomized as always, reflecting consistent support, versus all other responses. Respondents who answered always to both social support questions were considered to have consistent *functional support*.

### Covariates: Demographic Characteristics and Pregnancy-related Factors

Covariates that might impact self-reported mental health as well as the assessment of social support were conceptualized in two domains: demographics and pregnancy-related factors, which included pregnancy-related conditions, excluding symptoms of PMADs during pregnancy. Covariates were selected based on prior research. Demographic characteristics included race/ethnicity, maternal age, maternal education, marital status, country of birth, and insurer. Pregnancy-related covariates were parity, any pregnancy complications reported on the birth certificate, and preterm birth ([Table 1](#)).

### Statistical Analyses

We constructed an analytic sample that included only women with complete data on the PHQ-4, social support questions, and demographic and pregnancy-related covariates. We retained observations that had other or unknown race or insurance status, where missingness approached 15%. For these variables, we modeled the unknown category explicitly. Analyses were

**Table 1**  
Distribution of Social Support by Maternal Characteristics

	Unweighted <i>n</i>	Weighted%	Functional			Practical			Emotional		
			Weighted Results: %	95% CI	<i>p</i> Value*	Weighted Results: %	95% CI	<i>p</i> Value*	Weighted Results: %	95% CI	<i>p</i> Value*
All respondents	2372	100.0	45.9	(43.7–48.0)		49.5	(47.4–51.6)		56.3	(54.2–58.4)	
Race/ethnicity					.010			.008			<.0001
Latinx	1167	49.7	43.8	(40.9–46.8)		46.7	(43.8–49.7)		53.4	(50.4–56.3)	
White	584	26.7	51.7	(47.5–55.9)		55.5	(51.4–59.7)		64.8	(60.8–68.8)	
Black	207	4.6	47.2	(40.7–54.3)		48.9	(41.9–56.0)		61.9	(54.9–68.9)	
Asian and Pacific Islander	300	14.7	41.0	(35.1–46.7)		47.1	(41.2–53.0)		48.3	(42.3–54.2)	
Unknown/missing	114	4.3	48.3	(38.4–58.2)		52.3	(42.5–62.2)		58.1	(48.4–67.9)	
Age, years					.060			.046			.049
<25	526	21.7	48.8	(44.3–53.4)		53.0	(48.5–57.5)		56.2	(51.8–60.7)	
25–29	657	27.0	46.5	(42.5–50.5)		49.2	(45.1–53.2)		57.4	(53.4–61.4)	
30–34	704	29.5	47.0	(43.2–50.9)		51.0	(47.2–54.9)		59.2	(55.4–63.0)	
≥35	485	21.8	40.5	(35.9–45.1)		44.3	(39.6–48.9)		50.9	(46.3–55.6)	
Marital status					.040			.012			.005
Married	1358	58.7	47.7	(44.9–50.5)		51.8	(49.0–54.5)		58.8	(56.1–61.6)	
Nonmarried/other	1014	41.3	43.3	(40.0–46.5)		46.3	(43.0–49.5)		52.7	(49.4–55.9)	
Country of birth					<.01			<.0001			<.0001
United States	1545	65.3	52.0	(49.4–54.6)		54.9	(52.3–57.5)		62.7	(60.1–65.2)	
Other country	827	34.7	34.3	(30.9–37.7)		39.3	(35.8–42.8)		44.3	(40.7–47.8)	
Education					.020			.008			.013
High school or less	751	32.3	42.2	(38.5–46.0)		45.1	(41.4–48.9)		51.6	(47.8–55.3)	
Some college	778	33.2	48.4	(44.7–52.1)		51.5	(47.8–55.2)		57.6	(54.0–61.3)	
4-year college	456	18.6	50.2	(45.4–55.1)		54.9	(50.1–59.7)		61.1	(56.4–65.8)	
Some graduate school or more	387	15.8	42.7	(37.6–47.9)		47.7	(42.4–52.9)		57.3	(52.1–62.5)	
Insurer					<.01			<.0001			<.0001
Medi-Cal	1190	48.6	39.7	(36.8–42.6)		43.3	(40.3–46.2)		49.0	(46.0–52.0)	
Private insurance	1092	47.4	52.1	(49.0–55.3)		56.1	(53.0–59.2)		63.4	(60.4–66.5)	
Missing/other	90	4.0	46.5	(35.4–57.6)		46.5	(35.4–57.6)		60.0	(49.1–70.9)	
Parity					.040			.055			.052
Primiparous	1010	41.1	48.5	(45.3–51.7)		51.9	(48.7–55.2)		58.8	(55.6–61.9)	
Multiparous	1362	58.9	44.0	(41.2–46.8)		47.8	(45.0–50.6)		54.5	(51.8–57.3)	
Pregnancy complications					.980			.850			.825
No	1472	62.6	45.9	(43.2–48.6)		49.3	(46.6–52.0)		56.5	(53.8–59.1)	
Yes	900	37.4	45.8	(42.4–49.3)		49.7	(46.3–53.2)		56.0	(52.5–59.4)	
Preterm birth					.160			.270			.035
No	2222	93.5	45.5	(43.3–47.6)		49.2	(47.0–51.4)		55.7	(53.5–57.9)	
Yes	150	6.5	51.6	(43.2–59.9)		54.0	(45.7–62.3)		64.8	(56.9–72.7)	
Prenatal depressive symptoms (PHQ)					<.01			.000			<.0001
No	2050	86.4	47.84	(45.6–50.1)		51.0	(48.8–53.3)		58.6	(56.3–60.8)	
Yes	322	13.6	33.27	(27.8–38.8)		39.6	(34.0–45.3)		41.7	(36.0–47.4)	

Abbreviations: CI, confidence interval; PHQ, Patient Health Questionnaire.

\* A *p* value of < .05 suggests that there is a significant association between consistent social support and the demographic variable.

completed using the LtMC recommended survey weights to account for the survey design and ensure findings were representative of women giving birth in California in 2016. We examined the distribution of demographic characteristics stratified by social support (Table 1) and symptoms of PMADs (postpartum anxiety, postpartum depressive symptoms, and total symptom burden; Table 2) using  $\chi^2$  tests for categorical data. Similar bivariate analyses were used to characterize the relationship between the domains of social support and study outcomes (Figure 1).

The multivariable model building strategy was conducted in three steps. We began by running logistic regression models to assess the unadjusted relationship between the three measures of PMADs and social support (Table 3, Set 1 Models). We report the odds ratios (ORs) and 95% confidence intervals (CIs). The next set of models included demographic and pregnancy-related covariates (Table 3, Set 2 Models). The final set of models assessed the effect of prenatal symptoms of PMADs on postpartum outcomes

(Table 3, Set 3 Models). Because of the very strong association between prenatal and postpartum symptoms, we sought to assess whether the relationship between social support and postpartum symptoms was attenuated after controlling for reported prenatal symptoms. We also tested whether prior prenatal symptoms modified the relationship between social support and postpartum symptoms by adding a functional social support  $\times$  prenatal symptoms interaction term in the models. Because we did not find any significant difference between the associations of emotional, practical, and functional social support and PMADs in bivariate (Figure 1) or multivariate analyses (Supplementary Table 2), the presentation of study findings focuses of the combined variable, functional social support (Table 3).

## Results

The final analytic sample for this study included 2,372 women. The percent of excluded observations was less than 7%



**Table 2**  
Distribution of Postpartum Anxiety, Depressive Symptoms, and Total Symptom Burden by Maternal Characteristics

	Postpartum Anxiety		p Value	Postpartum Depressive Symptoms		p Value	Total Symptom Burden*		p Value
	%	95% CI		%	95% CI		%	95% CI	
All respondents	9.5	(8.2–10.8)		6.6	(5.5–7.6)		7.0	(5.9–8.1)	
Race/ethnicity			.02			.59			.18
Latinx	8.2	(6.6–9.9)		6.4	(4.9–7.8)		6.4	(4.9–7.9)	
White	11.2	(8.5–14.0)		5.9	(3.8–7.9)		7.7	(5.4–10.0)	
Asian and Pacific Islander	7.5	(4.4–10.6)		6.9	(3.9–9.9)		5.7	(3.0–8.3)	
Black	14.1	(9.1–19.1)		10.0	(5.6–14.4)		10.9	(6.4–15.4)	
Unknown/missing	15.1	(7.7–22.5)		8.0	(2.1–13.9)		10.6	(4.1–17.0)	
Age, years			.45			.03			.06
<25	10.4	(7.5–13.2)		9.6	(6.9–12.3)		9.9	(7.1–12.7)	
25–29	10.6	(8.1–13.2)		6.0	(4.1–8.0)		6.6	(4.5–8.6)	
30–34	9.1	(6.8–11.3)		5.3	(3.6–7.1)		6.4	(4.4–8.3)	
35+	7.9	(5.4–10.4)		5.8	(3.5–8.1)		5.7	(3.5–7.3)	
Marital status			.07			.16			.06
Married	8.5	(6.9–10.1)		5.9	(4.6–7.3)		6.1	(4.8–7.5)	
Nonmarried/other	10.9	(8.8–13.0)		7.5	(5.7–9.2)		8.3	(6.5–10.2)	
Country of birth			<.01			0.15			0.01
United States	11.0	(9.4–12.7)		7.1	(5.8–8.5)		8.1	(6.6–9.6)	
Other country	6.6	(4.8–8.5)		5.5	(3.8–7.2)		5.0	(3.5–6.6)	
Education			<.01			.42			.21
High school or less	6.6	(4.6–8.5)		5.9	(4.0–7.7)		6.2	(4.4–8.1)	
Some college	12.1	(9.6–14.6)		7.8	(5.8–9.8)		8.7	(6.6–10.9)	
4-year college	9.2	(6.3–12.0)		6.4	(4.0–8.9)		6.3	(3.9–8.7)	
Some graduate school or more	10.5	(7.3–13.6)		5.5	(3.1–7.9)		6.1	(3.6–8.5)	
Insurer			.19			.34			.68
Medi-Cal	8.6	(6.9–10.3)		7.0	(5.5–8.5)		7.1	(5.6–8.6)	
Private insurance	10.0	(8.1–11.9)		5.8	(4.3–7.3)		6.8	(5.2–8.4)	
Missing/other	14.4	(6.5–22.2)		9.6	(2.5–16.8)		9.4	(2.6–16.2)	
Parity			.25			.65			.76
Primiparous	8.6	(6.8–10.5)		6.8	(5.2–8.5)		6.8	(5.2–8.5)	
Multiparous	10.1	(8.4–11.8)		6.3	(4.9–7.8)		7.2	(5.7–8.7)	
Pregnancy complications			.23			.74			.52
No	8.9	(7.4–10.4)		6.7	(5.3–8.0)		6.8	(5.4–8.1)	
Yes	10.5	(8.3–12.7)		6.3	(4.6–8.0)		7.5	(5.6–9.4)	
Preterm birth			.38			.65			.96
No	9.7	(8.3–11.0)		6.6	(5.5–7.7)		7.0	(5.9–8.2)	
Yes	7.3	(2.7–11.8)		5.6	(1.8–9.5)		6.9	(2.6–11.3)	
Prenatal depressive symptoms (PHQ)			<.01			<.01			<.01
No	6.0	(4.9–7.1)		3.0	(2.2–3.8)		3.5	(2.7–4.4)	
Yes	31.9	(26.4–37.4)		28.9	(23.6–34.1)		29.3	(24.0–34.7)	

Abbreviations: CI, confidence interval; PHQ, Patient Health Questionnaire.

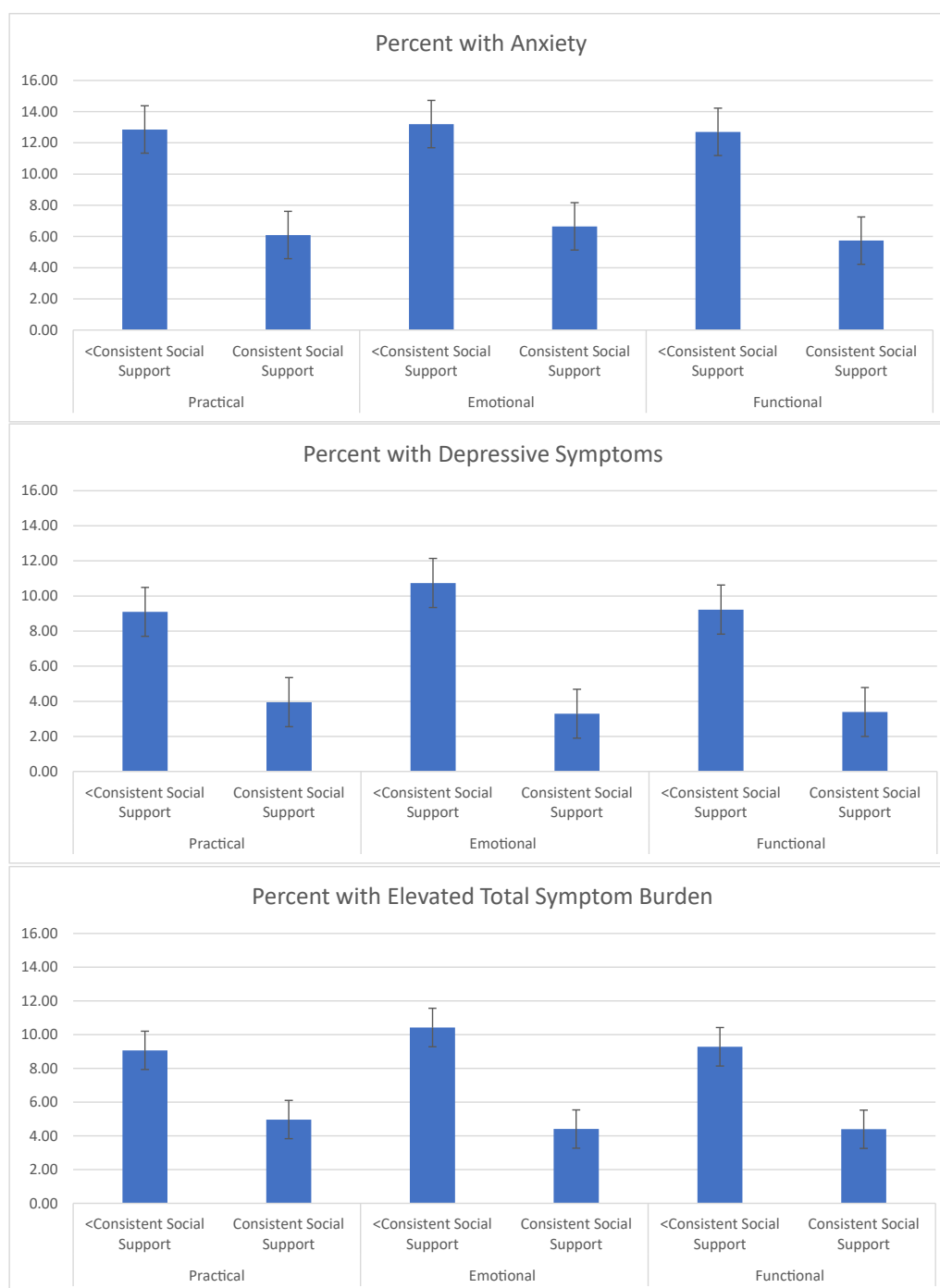
Based on the recommended scoring algorithm: Postpartum anxiety = PHQ-4 of score  $\geq 3$  on the two anxiety questions.Postpartum depressive symptoms = PHQ-4 score  $\geq 3$  on the two depression questions.Total symptom burden = Total score on the PHQ-4; a participant with a score of  $\geq 6$  is considered to have “moderate” or “severe” symptoms and an elevated total symptom burden.

( $n = 167$ ). Sixty-seven observations were excluded because the mental health or social support variables were missing. The remaining 100 observations were excluded owing to missing covariates, primarily age and education. Among observations that had complete social support and mental health data, but were excluded for missing covariates, there were no significant differences of reported consistent social support ( $p = .22$ ) or symptoms of PMADs ( $p = .52$ ).

The sample demographics are presented in Table 1 and are reflective of the demographics of the women giving birth in California in 2016. For the total sample, we report the unweighted  $N$  and the weighted percentages. Women were 49.7% Latinx, 26.7% White, 14.7% Asian and Pacific Islander, and 4.6% Black; 34.7% were born outside of the United States, and 58.7% were married. Almost one-third (32.3%) had less than a high school education and about one-half were covered by Medi-Cal, the state's Medicaid program, which was available to women with incomes of up to 138% of the federal poverty level (Health for California, n.d.). For pregnancy-related variables, 41.1% were primiparous and 6.5% of women had

a preterm birth, defined as less than 37 completed weeks gestation. Almost 14 % (13.6%) of women reported moderate or severe symptoms of PMADs during the prenatal period.

Regarding social support (Table 1), 56.3% reported consistent emotional support, 49.5% consistent practical support, and 45.9% consistent functional support. Overlap in report of social support across domains was considerable; only 14% of women reported differences between emotional and practical support. We found significant differences in reported social support based on almost all demographic characteristics. Women who were Latinx or Asian/Pacific Islander, unmarried, born outside the United States, publicly insured, or had less than a high school education reported lower social support compared with women who were non-LatinX White, married, born in the United States, privately insured, or had a college degree. None of the pregnancy-related factors were associated with lower social support. Across demographic characteristics, all women consistently reported higher levels of emotional versus practical social support.



**Figure 1.** Percent of mothers reporting perinatal mood and anxiety disorder (PMAD) symptoms by domains of social support. All differences between levels of social support are significant at  $p < 0.05$ .

At the time of survey administration, 9.5% of women reported anxiety, 6.6% depressive symptoms, and 7.0% elevated total PMADs symptom burden, defined as moderate to severe overall symptoms. Unlike social support, we did not observe consistent differences in the proportion of women experiencing either postpartum anxiety, depressive symptoms, or elevated total PMAD symptom burden based on demographic and pregnancy-related factors (Table 2). However, we did find a difference in the covariates that were associated with

anxiety compared with those associated with depressive symptoms. Race/ethnicity, country of birth, and education were significantly associated with postpartum anxiety but not postpartum depressive symptoms; in contrast, age was significantly associated with depressive symptoms but not anxiety. In this sample of Californian women, Latinx and Asian/Pacific Islander mothers, mothers with less than a high school education, and mothers born outside of the United States were less likely to report anxiety. Younger mothers

**Table 3**

Adjusted Odds Ratios for Relationship between Domains of Social Support and Postpartum Anxiety, Depressive Symptoms, and Total Symptom Burden

	Anxiety OR (95% CI)	Depressive Symptoms OR (95% CI)	Total Symptom Burden OR (95% CI)
<b>Models 1: Unadjusted models</b>			
Social support practical	0.44 (0.32–0.61)	0.41 (0.28–0.60)	0.52 (0.37–0.75)
Social support emotional	0.47 (0.35–0.63)	0.28 (0.19–0.42)	0.40 (0.28–0.57)
Social support functional	0.42 (0.30–0.58)	0.35 (0.23–0.52)	0.45 (0.31–0.65)
<b>Models 2: Controlling for demographics/pregnancy-related factors*</b>			
Social support practical	0.39 (0.28–0.55)	0.39 (0.26–0.57)	0.48 (0.33–0.69)
Social support emotional	0.40 (0.29–0.55)	0.26 (0.18–0.39)	0.35 (0.24–0.51)
Social support functional	0.37 (0.26–0.52)	0.32 (0.21–0.49)	0.40 (0.28–0.59)
<b>Models 3: Controlling for demographic/pregnancy-related factors + PN symptomatology†</b>			
Social support practical	0.43 (0.31–0.61)	0.45 (0.30–0.68)	0.56 (0.38–0.82)
Social support emotional	0.48 (0.35–0.67)	0.33 (0.22–0.51)	0.45 (0.30–0.66)
Social support functional	0.43 (0.30–0.61)	0.40 (0.26–0.62)	0.50 (0.34–0.74)

Abbreviations: CI, confidence interval; PHQ, Patient Health Questionnaire.

\* Models in Set 2 adjusted for race/ethnicity, maternal age, education, nativity, marital status, insurance, parity, preterm birth, and pregnancy complications.

† Models in Set 3 adjusted for race/ethnicity, maternal age, education, nativity, marital status, insurance, parity, preterm birth, pregnancy complications, and for moderate/severe prenatal symptomatology defined as total PHQ-4 score  $\geq 6$ .

were more likely to report depressive symptoms. Only a history of prenatal PMAD symptoms was significantly associated with all domains of PMADs—anxiety, depressive symptoms, and total PMADs symptom burden.

In bivariate analyses examining the relationship between social support and women who reported postpartum anxiety, depressive symptoms, and elevated total PMAD symptoms (Figure 1), we found significant and consistently lower levels of PMAD symptoms among women who had consistent functional support, for example, that they reported always to the social support questions. For example, 4.4% of women reporting having support always reported depressive symptoms compared with 9.3% of women who did not have consistent social support.

In unadjusted multivariate analyses (Table 3, Set 1 Models), all domains of social support were significantly associated with a decreased odds of reported PMAD symptoms. In general, women with consistent levels of social support were 40% less likely to report anxiety, depressive symptoms, or an overall high symptom burden in the postpartum period. All adjusted ORs (aORs) of the associations between social support and PMAD symptoms remained significant when we controlled for demographic characteristics and pregnancy-related factors; very minor increases in the strength of the association were seen across all models. The aORs and 95% CIs for the likelihood of women with consistent social support reporting anxiety, depressive symptoms, and elevated total symptom burden were 0.37 (95% CI, 0.26–0.52), 0.32 (95% CI, 0.21–0.49), and 0.40 (95% CI, 0.28–0.59), respectively (Table 3, Set 2). Regarding demographic and pregnancy-related factors, we found that primiparous women and those born outside of the United States were less likely to report anxiety in the Set 2 models, which included demographic and pregnancy-related factors. As we observed in bivariate analyses, the demographic characteristics associated with postnatal depressive symptoms differed from those associated with anxiety symptoms. In addition to social support, only younger age was associated with increased depressive symptoms. In Set 2, models predicting total elevated symptom burden, only younger age remained a significant predictor (Supplementary Table 2 presents the full models).

The third set of models (Table 3, Set 3 Models) added a history of prenatal PMAD symptoms. Model estimates suggested that prenatal symptoms were highly predictive of postnatal symptoms. Women with prior moderate or severe symptoms of

anxiety and depression during their pregnancy were between 7 and 13 times more likely to have symptoms postnatally; aORs ranged from 7.16 (95% CI, 5.07–10.11) in models predicting anxiety to 13.11 (95% CI, 8.88–19.34) in models predicting depressive symptoms (Supplementary Table 2 presents the full models). The strength of this association was greatest for women reporting postnatal depressive symptoms. The association between social support and PMAD symptoms remained significant in all models, although slightly attenuated. Once a history of prenatal symptoms was included in the model, none of the demographic and pregnancy-related covariates remained significant in the models predicting depressive symptoms and total symptom burden. In the models predicting anxiety, multiparity and low educational attainment were significant predictors. Tests for effect moderation based on prenatal symptoms did not suggest that the effect of social support changed significantly depending on whether or not a woman had prenatal PMAD symptoms. The  $p$  value for the prenatal symptoms  $\times$  social support interaction term was greater than .05 in all models ( $p = .21$  anxiety,  $p = .25$  for depressive symptoms, and  $p = .09$  total symptom burden). Results were similar in models examining the effect of emotional and practical social support.

## Discussion

Our findings demonstrate that consistent social support, regardless of domain, was associated with decreased likelihood of experiencing symptoms of PMADs in the postpartum period. This association, suggesting the protective nature of social support, was observed for anxiety symptoms, depressive symptoms, and total symptom burden. The association was maintained controlling for demographic characteristics and pregnancy-related factors. Prenatal symptomatology was the strongest predictor of postnatal PMAD symptoms. However, the independent, and potentially protective, effect of social support persisted in all models, even after assessing for confounding and effect moderation by prenatal symptoms.

Overall, our findings are consistent with previous research, but contribute to understanding of the relationship between social support and PMADs in important ways. We identified multiple demographic and pregnancy-related factors that were associated with reports of lower social support. These findings can guide social support interventions toward women most

likely to benefit. Findings also suggest that the effect of social support is consistent among women who report both anxiety and depressive symptoms, thus allowing greater flexibility in the design and targets of social support interventions.

Our findings lend support to the hypothesis that postpartum anxiety and depressive symptoms represent distinct but overlapping domains of symptomatology. We identified a difference in the magnitude of the association between prenatal and postnatal PMAD symptoms among mothers with elevated depressive symptoms versus anxiety. A history of prenatal PMAD symptoms increased the odds of postnatal depressive symptom by more than 13-fold, compared with 7-fold for postnatal anxiety. In addition, our analysis suggests that different demographic characteristics are associated with postnatal anxiety as compared with postpartum depressive symptoms. Interestingly, a greater proportion of non-Latinx Black and non-Latinx White women reported anxiety than depressive symptoms. For Latinx and Asian/Pacific Islander women, the proportions were fairly similar. The question of why some groups are at higher risk for anxiety versus depressive symptoms is unclear. It may be due to cultural conceptualizations of symptoms (Jimenez Fernandez et al., 2018; Kaiser & Weaver, 2019); it is an area requiring further study. We also found that women with the lowest educational attainment and those who were born outside of the United States were the least likely to report postnatal anxiety. These findings and the absence of associations between PMAD symptoms and income (insurance status) and preterm birth were not consistent with most prior research findings (Dennis, Merry, et al., 2017b; Farr, Dietz, O'Hara, Burley, & Ko, 2014). These differences may be related to the specific demographics of California, particularly the composition of the Latinx population. California's Latinx population is predominantly of Mexican ancestry and many are recent newcomers to the United States (California Senate Office of Research, 2017). As such, the healthy immigrant effect may affect associations between traditional demographic risk factors and PMAD symptoms, as it does for birth, cancer, and cardiovascular outcomes (Anderson, Hatch, Comacchio, & Howard, 2017; Fuentes-Afflick, Hessol, & Pérez-Stable, 1999; Markides & Coreil, 1986). Our findings also highlight the importance of considering specific ethnocultural contexts before generalizing patterns of risk across racial and ethnic subgroups.

One of our study's strengths is its large, diverse, representative sample and examination of different domains of social support. The LtMC survey used sampling weights to allow survey estimates to be representative of the mothers giving birth in California in 2016. The survey gathered detailed information regarding demographic characteristics and women's experience giving birth and the data were linked to birth certificate data, allowing the inclusion of pregnancy complications into the modeling. However, our study has several limitations that are inherent in observational studies and survey research. Measurement of social support and mental health were based on women's self-report, which may be subject to recall and desirability biases. Although quite brief, the PHQ-4 has been well validated and is highly correlated with the longer measures—the PHQ-8 and Generalized Anxiety Disorder-7—from which it is derived. Importantly, higher scores are strongly associated with functional impairments that may be particularly salient for new mothers (Kroenke et al., 2009). Because the surveys were conducted between 2 and 11 months postpartum, reports of PMAD symptoms could differ depending on the time since birth. However, analyzing symptoms by time since birth did not identify any clear trend, or critical period, of

greater or lesser reports of anxiety or depressive symptoms. Despite including detailed data on demographic and pregnancy-related factors, it is possible that the analysis may be affected by residual confounding.

### Implications for Policy and/or Practice

This study suggests that consistent social support may serve as a protective factor against postpartum symptoms of PMADs. The benefits of consistent social support were observed regardless of income, race and ethnicity, birth experience, social support domain, and prenatal symptomatology. Because many predictors of PMADs are not modifiable, social support stands out as an important target for intervention, particularly considering the COVID-19 pandemic that has disrupted social networks and increased isolation. PMADs place a tremendous financial toll on society. A recent study by Luca et al estimated the average annual cost of a mother-child dyad with PMADs was \$5,300 (Luca et al., 2020). Prior research has demonstrated the potential of easily implemented interventions that increase social support to reduce the incidence of PMADs (Dennis, 2014; Dennis & Dowswell, 2013; Dukhovny et al., 2013). New studies are exploring delivery modes (text messages, group prenatal care, brief group intervention) that would support broad, cost-effective dissemination (Dol, Aston, McMillan, Tomblin Murphy, & Campbell-Yeo, 2021; Mazzoni et al., 2020; Van Lieshout et al., 2021). Targeted preventive interventions to strengthen women's social networks may represent a promising approach to decrease the burden of postnatal anxiety and depressive symptoms on women, their children, and society.

### Conclusions

This study suggests that consistent social support serves as a robust protective factor against postpartum symptoms of PMADs. Because many predictors of PMADs are not modifiable, social support stands out as an important target for programmatic intervention.

### Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.whi.2022.01.005>.

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